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High Thickness Acrylamide Photopolymer for Peristrophic Multiplexing

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The acrylamide photolymers are considered interesting materials for holographic media [1,2]. They have high difraction efficiency (ratio of the intensities of the diffracted and the incident beams), an intermediate energetic sensitivity among other materials and post-processing steps are not necessary, therefore the media is not altered [3]. The layers of these materials, about 1 mm thick, are a suitable media for recording many diffraction gratings [4] in the same volume of photopolymer using peristrophic multiplexing technique, with great practical importance in the field of holographic memories type WORM (write once read many) [5]. In this work we study the influence of recording diffraction gratings by peristrophic multiplexing in the acrylamide photopolymer characteristics. We analyze the holographic behaviour of an acrylamide photopolymer with hydrophilic binder in layers around 1 mm thickness. The photopolymer is composed of acrylamide as the polymerizable monomer, triethanolamine as radical generator, yellowish eosin as sensitizer and a binder of polyvinyl alcohol [6]. We analyze the holographic behaviour of the material during recording and reconstruction of diffraction gratings using a continuous Nd:YAG laser (532 nm) at an intensity of 5 mW/cm^2 as recording laser. The response of the material is monitored in real time and after recording with an He-Ne laser. We study the recording and reconstruction process of diffraction gratings of 1125 lines/mm, in a 1 mm photopolymer thick layers with polyvinyl alcohol Mw=130000 binder. Particularly, after recording, it is shown an increase of the diffraction efficiency with time, that is related to diffusion of components in the polymeric binder. We also analyze the influence of hologram exposure to incoherent light, after recording, in the main holographic parameters, more specifically, the decay of difraction efficiency for each hologram, specially when the dinamic range is consumed totally by multiplexing of a sufficient holograms number.

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